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Manufacturing organization

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LaSalle Extension University

THE MANUFACTURING ORGANIZATION

ONE OF A SERIES OF LECTURES IN A SYSTEMATIC COURSE

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THE MANUFACTURING ORGANIZATION.

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Organization defined. By organization we mean the distinct laying out of the scope and limits of action and relations to each other of departments and officials along such lines as will secure greatest effectiveness and economy.

Certain principles of organization long recognized. The principles of successful organization have been known along military and governmental lines since remotest antiquity. It is not strange then that with the advent of steam power and the rapid invention of machinery for manufacturing purposes, we find certain principles which had been applied successfully to military and governmental organizations being applied to manufacturing undertakings.

Three-column type of commercial organization. Probably the most elementary and simplest type of manufacturing organization is what has been designated by Charles B. Going as the three-column type of organization. In this type we have the work divided into three groups: Financial, manufacturing, and selling.

Standardization. With the growth of manufacturing we find individual establishments increasing in magnitude as well as smaller establishments combining from time to time. This process of combination is accompanied by a tendency towards standardization and so we have today standard sizes of all screws, pipes, bolts, nuts, rivets and other detail parts as well as standard sizes of machinery, such as lathes, steam gas engines, electric dynamos and motors, irrespective of the fact that they may be made by manufacturers in remote parts of the same country and even in different

countries and who may be in keen competition with one another.

Specialization. Along with the process of standardization developed the principle of specialization. With the development of specialization, there came a decided decrease in demand for men who had learned a trade and an increasing demand for men possessing merely a special handicraft.

Distinction between organization and system. All of the above tendencies must be reckoned with in laying out the organization for a manufacturing establishment.

Organization is something entirely separate and distinct from system. No matter what the system may be, it cannot even be fairly tried out without an effective organization. A successful organization must develop leaders of strong individuality. It must give scope to ambition. It must develop such a sense of loyalty that each individual will yield his personal preference to the general welfare as well as the expressed policy and will of the organization as a whole.

Good organization brings progressive development. A successful organization will not only secure smooth, harmonious running of a manufacturing establishment, but it must insure its constant progressive development. Its leaders will be constantly looking forward, and the establishment controlled by such an organization will be constantly moving forward and not standing still.

Importance of selection of right men. The success of an organization depends largely on the selection of proper men to fill positions of heads of the various staff and line positions as well as proper assistant officials in the various departments.

The most successful managers are those who are recognized as managers of men primarily.

Intimate contact necessary. There must be intimate con-

tact between all the leading members o.. an organization so as to secure enthusiasm and co-operation.

Reasons for military type of organization. Inasmuch as the industrial revolution which brought about the need for industrial organization began about 150 years ago, it is natural that we find the old types of manufacturing organizations patterned after the military, governmental and mercantile organizations existing at that time. About 100 years after the industrial revolution, remarkable changes in military organization as well as in governmental organization began to take place. Many of these important principles have not as yet been applied to manufacturing establishments.

Differentiating of line and staff functions. One of the most important of these principles is that of differentiating line functions from staff functions. In the military organization the line division and assignment of line officers is a strictly numerical division. Promotion in the line organization is strictly automatic. Von Moltke developed the idea of staff organization in military matters and through this development secured for the Prussian army the efficiency which gave that army its great military prestige.

Staff principle applied to industry. To a certain extent industrial establishments more or less unconsciously adopted some of the principles of staff organization. Under the old system of line officers, the head of the line officers was the shop superintendent, and the other line officers under him, namely, the shop foremen, had to carry on many functions which the modern industrial organization turns over to the staff officials. The principle of staff organization is simply the selection of all of those activities which can be carried on to greatest advantage under the direction of a specialist with competent assistants and taking these activities out of the control of the line officials, whose duties

become in this matter more and more those of supervision and leadership.

Instruction of men in ranks. There is a difference of opinion as to whether or not a line officer or a staff officer can best act as an instructor to a man in the ranks. Some systems of management propose that the staff specialist shall instruct directly the man in the ranks, while others advocate methods by which staff assistants of instruction shall go only as far as line officers, giving the line officers exclusive supervisional jurisdiction over the men in the ranks.

Type of staff organization to be applied to industries. It would be very difficult to set down a standard type of staff organization to apply to all industrial establishments. Mr. Harrington Emerson has presented a generalization in which he divides staff control to cover four groups: (1) Men; (2) equipment; (3) materials; (4) methods and conditions.

The above type may be departed from. While this generalization may serve as a guide, it is by no means to be taken as a final standard. One of the most successful manufacturing establishments in the world is organized in the following manner:

A typical manufacturing organization. The head, who is designated as the works manager is a superior officer over all the heads of the staff as well as over the shop superintendent, and is head of the line. The staff or executive departments in this establishment are each independent of one another and independent of the superintendent. These various staff departments are as follows:

(a) Customers' orders and shipping department. This department looks after correspondence and orders, stock of finished machines, packing room, shipping and billing of machines and parts.

(b) Purchasing and stores department. This depart-

ment looks after all purchases, after the receiving of material and all stores of raw materials and supplies.

(c) Finished parts and production order department. This department issues all production orders to the shop for parts, issues all parts for machine manufacture and has supervision over the finished parts, stock room and stock of groups of parts.

(d) The works engineering department. This department has charge of light, heat, power, accident prevention, millwrights, electricians, plumbers, fire corps and watchmen.

(e) Designing and tool engineering. This department has charge of inventing, model making, specifications, catalog design, parts, and jig and tool making.

(f) Inspection department. This department has charge of inspection of materials, inspection of work in process, inspection of finished machinery, and inspection of new tools.

(g) Works accounting, labor and motion study department. This department has charge of the entire work of the cashier and bookkeeper and all costs and inventories of industrial betterments, of time records and payroll, of rate and method testing, of time studies and demonstrations; also of all welfare work, including suggestion system, shop publication, first aid to the injured, educational and recreational activities.

(h) The line organization is exceedingly simple. It consists of a superintendent with two assistant superintendents. One assistant superintendent looks after the manufacture of machines. In the manufacture of parts there is a distinct foreman for every distinct process, such as pattern shop, brass foundry, iron foundry, lathe work, boring metal work, planer work, drill press work, gear cutting, grinding, etc. In the division of the shop under the charge of the assistant superintendent who directs the

manufacture of machines, there is a foreman for each distinct assembling and erecting group, as well as a separate repair department.

Departmental and interdepartmental meetings. The relation and co-operation of staff and line can be worked out successfully only by regular systematic meetings of line officials with staff officials.

During these meetings of line officials with certain members of the staff, the aim should be to put the line officials in possession of such of the specialized information of the staff members as these line officials are capable of absorbing and imparting to the rank and file.

Place of time study men in organization. In some establishments it may be desirable for demonstrators and time study men to work together in the shop in the capacity of instructors to the men in the rank. Work of this sort is usually designated as time study work and is best conducted by means of a team of two men, consisting of a demonstrator, who is preferably a member of the rank and file under direct supervision of one of the petty line officers, and a man provided with a stop watch and accustomed to taking minute time records and observations as well as analyzing general operations into their distinct steps or motions. This man acts as a recorder and is usually an employe of one of the staff departments. When a team of this sort work together in a shop, the arrangements for such work should always be made through the petty line official in whose department the work is being done. This recognition of the line official as the direct superior officer of every member of the rank and file in his department is the most generally accepted plan of operation.

Functional foremanship. Mr. Fred W. Taylor designates a somewhat different type of foremanship, designated as functional or divided foremanship. Mr. Taylor does away altogether with the line officials and staff officials

and divides shop supervision into seven distinct classes. These classes are as follows:

(1) The routing foreman, who has direct authority over every workman in all matters relating to the order in which he does his work and in the matter of movement of the work from one part of the shop to another.

(2) The gang boss, who shows the workman how to set up a job on his machine and teaches him to make all his personal motions in the best and quickest way.

(3) The speed boss, who is a specialist on the proper speeds and tools to be used.

(4) The inspector, who sees to it that the foreman understands the drawing and construction of the work. He teaches the workman how to work on the right quality, to make it fine and exact where it should be fine, and rough and quickly where accuracy is not required.

(5) The time clerk, who has supervision over the men in regard to everything pertaining to pay, proper written reports and returns.

(6) The repair boss, who looks after adjustment, cleanliness, and general care of operating.

(7) The shop disciplinarian, who interviews the workman if he gets into trouble with any of his various bosses.

The aims of scientific management. The mistake should not be made of considering the principle of functional management as above outlined, as the sum and substance of the so-called Taylor System of management. The functional foremanship principle is the most radical departure of Mr. Taylor's system from other systems. The great aims of Mr. Taylor's system are:

(1) The development of a true science for each industry.

(2) The scientific selection of the workman.

(3) His scientific education and development.

(4) Intimate, friendly co-operation between the management and the men.

Mr. Taylor's philosophy of scientific management declares that the real worth of the world is measured by what man produces and that any institution that will restrict output as a permanent policy is an enemy of the public. The first obstacle to the realization of industrial efficiency is the fallacy of overproduction. The second obstacle is our own inefficient systems of management.

Benefits derived from scientific management. There are four great benefits derived from scientific management:

(1) The educating of the management itself so that it knows at least a portion of what the workingmen know. This means the assumption of new and unheard-of burdens and duties by the management in the way of gathering together, classifying and tabulating all the knowledge of an industry into a formulated science.

(2) Scientific selection and progressive development of the workingmen. This results in the establishment of more cordial relations between labor and employer. There has been no strike in any establishment operating under scientific management.

(3) The bringing together of the scientific knowledge of an industry and the methods of the management and the workingmen. The management is frequently more stubborn than the workingmen.

(4) The division of the entire system of production into two general sections: One section in which the work itself and the planning is handed over to the management; the other the doing of the work in accordance with the science and planning, being turned over to the workingmen.

What preliminary steps should precede introduction of new wage systems. In introducing improved or scientific methods of management it is always necessary to solve problems connected with arrangement of departments and

equipment, proper flow of work in process and material, and installing of scheduling and planning systems, before anything is undertaken in the way of improving the efficiency of the movement of the individual workingman and providing an incentive to him through the medium of a wage system which will give him increased compensation for increased efficiency.

Systematized, unsystematized and scientific management compared. Mr. H. P. Kendall, in testifying before the Interstate Commerce Commission, divided all types of management into three classes, namely, systematized, unsystematized and scientific. Each of these types of management may be investigated by considering five phases as they exist under each type: (1) Accounting, (2) purchasing, (3) storage of material, (4) expedition of work, and (5) efficiency of workers.

Probably 70 per cent of the manufacturers of the country would come at the present time under the heading of unsystematized management. In the unsystematized business the main feature is the annual statement which shows merely the results of the past year. The managers of the majority of manufacturing businesses do not know definitely whether they have made a profit or loss until months after the close of a fiscal year.

Systematized management not only provides records but arranges these records into periodic departmental reports. This type of management shows the *where,* but does not specify the *how.*

Scientific management will show the how as well as the where. It will show the expense accounts, profits and losses, assets and liabilities, at the end of every four weeks. It will plan all work in advance and specify how it is to be done. Under scientific management, costs come as a by-product of planning.

Increasing the efficiency of the individual workman.

When we come to the problem of increasing the efficiency of the individual workingman, assuming that we have first arranged our departments and equipment for the greatest efficiency in flow of material and that we have planned our work in advance instead of putting it up to the workman to plan his work, the next step is to make accurate time and method studies of all of the operations performed by each workingman. Such time and method studies are best conducted by a team of two men, consisting of a demonstrator and a recorder. The demonstrator should be the best mechanic in the employ of the company on the particular process which is being investigated. The recorder should be a man capable of analyzing processes into elementary steps and taking accurate observations with a stop watch.

This team by actual observation and demonstration agree on what is to be considered the standard time and method under given conditions of equipment for each process. A detailed instruction sheet is then prepared for every workman who is to perform this process, telling him what each step in the process is and how long each step should take. The standard time having been once determined on, it should not be changed unless there is a change in the equipment and methods. From this rule there must be absolutely no variation. The time once set must be permanent, and not for six months or one year; otherwise, the system will fail. Next must be provided the wage system, which offers an incentive worth while for the continuous stimulation of interest, energy, enthusiasm, faithfulness, and loyalty.

Wage methods. Wage methods may be (1) day rate, (2) piece rate, (3) premium system, (4) bonus system, or (5) efficiency system.

(1) Day rate. In this system we can compensate for individual efficiency by keeping records of those men who show a high percentage of continuous achievement of the

specified time standards and by raising their fixed hourly and daily rates.

(2) Piece rate. In the piece rate system we can determine a piece rate which shall pay a man a goodly percentage over his ordinary day rate for his accomplishment of the work within a desired time. The percentage necessary may have to be only 20 per cent if increased efficiency demands but little skill or exertion, and it may have to be increased as high as 100 per cent if it demands skill and considerable exertion. The piece rate system is defective in that it rewards for occasional spurts and does not offer an extra reward for steady, continuous efficiency.

(3) Premium system. As originally instituted, the premium wage system establishes the time standard on the basis of the records of previous performances. As originally used by Mr. Halsey, the workingman was paid one-half of his regular rate per hour for all time saved in a given process under the average record of previous performance. Of late years, however, the standard of premium time, instead of being based on average previous performances, is based on accurate time study and demonstration. Under these conditions a certain per cent, usually 20 to 30, is added to the time established by time study and demonstration, as the time at which the premium is to begin. The premium wage system under these conditions does not offer the incentive for getting right down to the minimum time and the maintenance of continuous efficiency as do the two following systems.

(4) Bonus system. In this system a tabulated list of various times is established for each job and an increase in scale of specific definite cash bonus amounts is listed, which will be paid the workman in addition to the regular wages for accomplishing work within a given time. Under this system a workman has right before him, when he be-

gins his work, a definite cash bonus, for the accomplishment of the work in a certain time.

(5) Differential rate. This system was originated by Mr. F. W. Taylor and was intended to remedy the defects of the ordinary piece rate. Two different rates are in force for the same job—a high price for every piece in case of rapid, accurate work, and a lower price in case the workman is slow or the work imperfect. Also the rates are fixed from accurate knowledge rather than guesswork.

Securing co-operation of line officials. The co-operation of line officials is best secured by the holding of frequent meetings at which the working of the wage system is discussed and plans for its smooth running perfected. It is desirable to introduce a plan by which a distinct bonus fund is established for each foreman, this bonus fund varying with the degree of success achieved by the men in his department under the wage system. For instance, a prominent machine tool building company operating under the Halsey 50 per cent premium bonus, credits each foreman two cents an hour for each hour of workman's time saved and charges against this fund two cents an hour for each hour lost by any workman by reason of his time overrunning the standard time allowance. At the end of each week the foreman is paid a cash bonus which is the excess of the credits over the charges. The statistics of this company show that the foremen are all earning extra pay in this manner, varying from two to ten dollars per week. The assistant superintendent and superintendent also share in the same manner, they being paid one-half cent per hour for each hour saved in the entire shop, a charge being made against this bonus of one-half cent per hour for each hour lost. In the case of these two officials, the net results represented an increase of several hundred dollars a year to their respective salaries.

Problems involved in the attainment of industrial

efficiency. While a great deal of attention has been given during the last year or two to questions involved in connection with the securing of greater efficiency of production, as brought prominently before the public by the work of industrial engineers and others sometimes designated as efficiency engineers, it must be borne in mind that industrial efficiency involves:

(1) Efficiency in corporate organization and financing.

(2) Efficiency in general accounting systems.

(3) Efficiency in selling organization systems and methods.

(4) Efficiency in factory administration, organization, methods and system.

As above indicated the work of industrial engineers and efficiency engineers has been primarily centered on item 4.

The work of the industrial or efficiency engineer. The writer, in his book on "Factory Organization and Administration," has outlined in the following manner the work of the industrial engineer. This definition was embodied by a prominent attorney as part of his plea in a case which attracted world-wide attention and has also been used in a recently published book on "Cost Keeping." The definition is as follows:

"The industrial engineer considers a manufacturing establishment just as one would an intricate machine. He analyzes each process into its ultimate, simple elements, and compares each of these simplest steps or processes with an ideal or perfect condition. He then makes all due allowances for rational and practical conditions and establishes an attainable commercial standard for every step. The next process is that of attaining continuously this standard, involving both quality and quantity, and the interlocking or assembling of all of these prime elements into a well-arranged, well-built, smooth-running machine. It is quite evident that work of this character involves technical knowledge

and ability in science and pure engineering, which do not enter into the field of the accountant. Yet the industrial engineer must have the accountant's keen perception of money values. His work will not be good engineering unless he uses good business judgment. He must be able to select those mechanical devices and perfect such organization as will best suit present needs and secure prompt returns in profit. He must have sufficiently good business sense to appreciate the ratio between investment and income. He must be in close enough touch with the financial management to be able to impress upon them the necessity of providing sinking funds to provide for the more perfect installations and organizations which future demands of a more educated and enlightened public will necessitate.

"The industrial engineer today must be as competent to give good business advice to his corporation as is the skilled corporation attorney. Upon his sound judgment and good advice depend very frequently the making or losing of large fortunes."

Selection of men for staff and line positions. It will readily be seen that the field of industrial operations is so comprehensive that it would be folly to dogmatize by stating that on the one hand an engineering education or engineering experience would fit a man for any position, or on the other hand to claim that education and experience in accounting and business theory are the proper requisites.

A careful examination will reveal the fact that certain of the staff positions demand a predominance of engineering; there are others that demand the predominance of accounting training. There are still others where engineering and accounting blend together. Then there are still others where a legal turn of mind is desirable. On the other hand, there are certain positions where the science of salesmanship, psychology, etc., play an important part.

It would be a hopeless task for a man to attempt to train himself as a specialist in all of the lines which must be brought into play in the modern industrial organization. Each individual who hopes to rise, however, must have a sufficiently comprehensive view of the situation to see the relative importance and place of each of the special fields which have been indicated.

Quiz Questions.

NOTE: These questions are for the student to use in testing his knowledge of the lecture. The answers should be written out fully in a note book, but are not to be sent in to the University.

1. What do you understand by the three-column type of commercial organization?
2. What is the distinction between organization and system?
3. What is the principle of staff organization?
4. What is the importance of the selection of men?
5. Differentiate the scope of control of the staff organization from that of the line organization.
6. Discuss the Taylor System of management.
7. What benefits are derived from scientific management?
8. Discuss the means of increasing the efficiency of the individual workman.
9. Which wage system offers the greatest incentive to increased efficiency on the part of the workman? Give reasons.
10. How is the co-operation of line officials best secured?
11. What problems are involved in the attainment of industrial efficiency?
12. What is the nature of the work of an industrial engineer?